2 February 1960

MEMORANDUM TO THE FILE

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FROM : [redacted]

SUBJECT: High Frequency Spiral Antenna

1. Mr. Kapitan, the Liaison Officer, notified us that a discussion of the High Frequency Spiral Antenna would be held 1400 hours, 1 February 1960 in Building T3, Room 1515 under the auspices of the Navy. Several members of the Engineering Division attended.

2. The meeting was opened by Commander Dixon of the office of the Chief of Naval Operations. Navy had a requirement for an antenna which would be transportable, that is, it could be knocked down in a kit which could be carried in a van and could be erected within a few hours by a semi-skilled crew. This antenna must have a frequency range above 9 mcs., at least equal to that of a rhombic, and have gain comparable to that of a rhombic. The antenna should also reduce selective fading. Commander Dixon introduced Mr. Dunlevy of All Products Company.

3. Mr. Dunlevy gave us a hasty background of the subject mentioned. The Bureau of Standards had previously published a report on experiments with polarization diversity at HF. It had been found that two dipoles, 1 vertical and 1 horizontal on the same support, gave equivalent performance to two horizontal dipoles 11 wave lengths apart. Apparently signal strength does not fade as much as it shifts in polarity. Accordingly APC experimented with models of equi-angular spiral antennas. Results were so encouraging that a full-scale model of a portable antenna was built.

4. This antenna consists of two circles, 70 feet in diameter, built of 3" thin-wall aluminum tubing, each section about 12 feet long. These are held in parallel planes by 3" fiber glass tubing. The active portion of the antenna is a spiral composed of three wires whose spacing increases from the center to the circumference of the circle and which are supported by fiber glass tubing. The second element is a reflector, having 18 radial elements and 9 concentric rings of aluminum tubing. The over-all height of the antenna is 96 feet, and it weight 900 pounds. The guys are of fiber glass rope, having an extruded vinyl cover. It is rotatable. The fixed models will probably have steel, rather than aluminum, conducting members. APC believes that without the limitations imposed by light weight and portability, the fixed models may have improved operating

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characteristics. The portable model requires a square space, 150 feet on a side. The fixed models will require a space 130 feet x 80 feet. Each model will cost about $7,000.00 apiece. The characteristic impedance of the spiral is 130 ohms. This is matched to a standard transmission line by a special coaxial conductor built into the spiral having an inner conductor of varying diameter.

5. Tests of the antenna show that it receives a fairly stable signal near sun rise and sun set when propagation conditions are such that a rhombic or other horizontally polarized antenna may be subject to very deep fading. The Navy was so favorably impressed with the results of the portable model that they have contracted for a fixed installation at Cheltenham, Maryland to use on their Londonderry, Ireland circuit.

6. The spiral antenna is said to outperform a convential rhombic except in periods of good propagation, such as at mid-day, but this is not considered a drawback since the signal to noise ratio at such times is usually high and the additional gain afforded by the rhombic is not needed. Moreover the spiral requires much less space and several units may be placed side by side without interaction.

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1. Data Sheets

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